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SUMMARY

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THE POTENTIAL OF THE COMPUTER AND HIGH-SPEED INFORMATION PROCESSING TECHNIQUES FOR INDUSTRIAL DEVELOPMENT

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THE POTENTIAL OF THE COMPUTER AND HIGH-SPEED INFORMATION PROCESSING TECHNIQUES FOR INDUSTRIAL DEVELOPMENT

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1. Recent advances in high-speed information processing, and their characteristic embodiment, the electronic computer, have two key contributions to offer to the industrial growth of the less developed areas. These are, first, the numerically controlled fabrication of the products of the engineering industries and, second, an integrated approach to the organization of efficient industrial development planning systems in these areas.

2. Numerically controlled fabrication methods promise to enlarge greatly the range of metal transforming and machinery industries that can be operated economically under the conditions prevailing in many of these areas. The principal factors tending to produce this result are: a drastic lowering of the minimum economic scale for individual products; a reduction of the level of operator skills required; a guarantee of uniformly high product quality; and an achievement of these benefits at favorable unit capital inputs. Some of the problems are: the comparatively large scale required for the productive facility as a whole, as distinguished from the scale of production of any one product; new skills required in maintenance, engineering and management; the fact that an integrated, numerically controlled plant represents a genuine technological innovation. It is held that the problems can be overcome by the establishment of suitably large plants, if need be on a regional basis; by on-the-job training of staff during a considerable initial operational period; and by a comprehensive study of the interrelations of all functions within new facilities of the kind proposed. The potential payoff from numerical control is truly momentous from the point of view of the less developed areas. With a domestic industry capable of turning out machinery and equipment at reasonable costs in terms of scarce resources, these areas will no longer find their potential savings dissipated and their growth strangled by foreign-exchange shortages on the one hand and formidable dis-economies of capital-goods production, on the other. The domestic manufacture of a variety of capital goods, consumer durables, agricultural and transportation equipment, in any event, will reduce the pressure on their balance of payments, and will make it easier for them to import the commodities whose production remains uneconomical or unfeasible.

3. The electronic computer and recent advances in the design of complex information processing systems also will permit a concentrated attack on the problem of establishing adequate industrial development planning organizations in the less developed areas. While no systems have been studied so far whose complexity would equal that of an entire economy or of the industrial sector, the problem of designing a planning subsystem within the economic system as a whole permits a powerful simplification. This is due to the fact that a major portion of the detailed management decisions pertaining to industrial production are typically left to

independent decision-making units: private firms or largely autonomous public enterprises. Thus the planning subsystem will have a hierarchical part complemented by a collection of independent decision-making units. Under these conditions, planning reduces to the spelling out of consistent policy objectives and suitable executive action at different hierarchical levels, and to the establishment of a pattern of incentives and constraints for the independent decision-making units to hold the general behavior of these consistent with overall policy objectives, while maintaining their freedom of adaptation to detailed environmental conditions. Planning in this sense requires the establishment of an orderly pattern of information flow, the analysis of data for deriving policy objectives and policy instruments, and the design of an integrated mechanism of policy execution and error correction. In relation to the design of the latter mechanism, recent experience with systems indicates the need for anticipating the occurrence of shocks and disturbances, the exact nature of which is unforeseeable, and consequently puts a premium on flexibility, adaptability and the shielding of the sensitive elements of the system. It is concluded that high-speed computers and related data processing techniques facilitate the organization and performance of the above functions so decisively that they promise a breakthrough in relation to the whole approach to industrial development planning.

4. While no quantitative conclusions are possible with regard to resource allocation to the new technology, it is conjectured that both numerically controlled fabrication and computer-aided industrial development planning will yield net saving of the three scarce resources, skills, foreign exchange and capital. Moreover, the production of computers and auxiliary equipment, or of some of their components and assembly operations, is a distinct possibility in the less developed areas.

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